Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Amendment of the Commission's Rules	)	
Regarding Dedicated Short-Range	)	WT Docket No. 01-90
Communication Services in the 5.850-	)	
5.925 GHz Band (5.9 GHz Band)	)	
	)	
Amendment of Parts 2 and 90 of the	)	
Commission's Rules to Allocate the	)	
5.850-5.925 GHz Band to the Mobile	)	ET Docket No. 98-95
Service for Dedicated Short-Range	)	RM-9096
Communications of Intelligent	)	
Transportation Systems	)	

EX PARTE COMMENTS

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SUMMARY

3M Company ("3M") hereby submits these ex parte comments in the above-captioned proceeding, to provide the Commission with additional information concerning the issues raised in its March 17, 2003 comments. As discussed below, 3M strongly supports the standards proposed for Dedicated Short Range Communications (DSRC) in the Commission's *Notice of Proposed Rulemaking and Order* ("NPRM") in the captioned proceeding. DSRC will greatly enhance public safety by providing police and fire personnel with improved capabilities and more rapid response times, and will allow such agencies to more effectively focus their resources. In this regard, 3M applauds the efforts of the Commission, the American Society for Testing and Materials (ASTM) and the Intelligent Transportation Society of America (ITS America) to make DSRC a reality. However, 3M remains concerned about two aspects of the proposed technical rules that could greatly hinder the ability of equipment manufacturers to develop important public safety technologies. In particular, the Commission should decline to adopt the antenna height correction factor proposed by ITS America in this proceeding, and should modify the emission mask previously adopted for DSRC.

The antenna height correction standard will impair the implementation of emergency traffic signal preemption technology that 3M is developing, by requiring the deployment of several transmitters where one would cover an intersection. ITS America's interference concerns are unfounded, because (1) the 2 Ray propagation model applied by ITS America is inappropriate for most intersections controlled by a traffic light; (2) traffic light preemption signals are of very short duration, and are high priority safety communications; (3) the power reduction proposed by ITS America is arbitrary

and unduly restrictive; and (4) the Commission and ITS America have proposed other measures that will eliminate interference.

The emission mask adopted for DSRC Class D devices appears to be too restrictive, and may hinder the manufacture of affordable public safety equipment. The Commission and the intelligent transportation service community have both emphasized the need for flexible use and technical standards for DSRC, without undue restrictions. The Commission should gather additional information based on testing, and only then finalize an emission mask that will allow the greatest possible flexibility for public safety operations.

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EX PARTE COMMENTS

3M Company ("3M") hereby submits these ex parte comments in the above-captioned proceeding, to provide the Commission with additional information concerning the issues raised in its March 17, 2003 comments. As discussed below, 3M strongly supports the standards proposed for Dedicated Short Range Communications (DSRC) in the Commission's *Notice of Proposed Rulemaking and Order* ("NPRM") in this proceeding.[1] DSRC will greatly enhance public safety by providing police and fire personnel with improved capabilities and more rapid response times, and will allow such agencies to more effectively focus their resources. In this regard, 3M applauds the efforts of the Commission, the American Society for Testing and Materials (ASTM) and the Intelligent Transportation Society of America (ITS America) to make DSRC a reality. However, 3M remains concerned about two aspects of the proposed technical rules that

[1] FCC 02-302, 17 FCC Rcd 23136, released November 15, 2002.

could greatly hinder the ability of equipment manufacturers to develop important public safety technologies. In particular, the Commission should decline to adopt the antenna height correction factor proposed by ITS America in this proceeding, and should modify the emission mask previously adopted for DSRC.[2]

I. THE COMMISSION SHOULD DECLINE TO ADOPT THE PROPOSED ANTENNA HEIGHT CORRECTION FACTOR

At paragraph 72 of the *NPRM*, the Commission requested comment on the proposal of ITS America to impose and antenna height correction factor on DSRC roadside units (RSUs). 3M has raised concerns about this correction factor (3M Comments at pp. 4-8), and hereby wishes to elaborate on its objection to this proposal. 3M notes that the antenna height correction factor is not a part of the consensus reached by the DSRC Standards Writing Group, of which 3M is a member.[3] Instead, the correction factor has been proposed by ITS America due to concerns about interference.[4] 3M objected to this proposal when participating in the Standards Writing Group, and must respectfully disagree with ITS America on this point. The antenna height correction standard will impair the implementation of emergency traffic signal preemption technology that 3M is developing. This technology will allow police, fire and rescue vehicles to clear an intersection by remotely controlling the timing of the traffic lights,

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[2] While 3M raised these concerns in its March 17, 2003 comments, it does not appear that ITS America addressed these issues in its reply comments or elsewhere in this proceeding.

[3] *See* ASTM 5.9 GHz DSRC Standards Writing Group Participation roster, Appendix C to ITS America July 9, 2002 Ex Parte Comments.

[4] *See* NPRM, *id.* at para. 72; ITS America July 9, 2002 Ex Parte Comments at p. 70.

thereby allowing the emergency vehicle to significantly reduce the time necessary to respond to an emergency.

The ITS America proposal would require a substantial power and operational range reduction for a public safety RSU antenna above 6 meters, thereby negating the original intent of high power operations for public service operations. Based on 3M's product research and development, this standard is too restrictive. In order to facilitate effective communications between emergency vehicles and the RSU controlling an intersection, it will often be necessary to mount the RSU antenna higher than 6 meters.[5] Current priority control systems are typically installed between 5 and 8 meters depending upon the existing intersection infrastructure. 3M does not expect that it will be necessary to mount antennas above 15 meters. However, the significant power decreases proposed for antenna heights between 6 and 15 meters will in many cases require the deployment of multiple antennas to control a single intersection, which can double or triple the costs of deploying this technology that must be incurred by cash-strapped state and local governments.[6] This will constitute an unnecessary cost impact on the Public Safety

[5] Communications range can be increased by raising either the RSU or OSU antenna height. The communications range is actual a function of both antenna heights. Since it is impractical to raise the OSU antenna height (you don't want a high antenna on a moving vehicle -- it may hit a power line or other obstacle), you have to raise the height the RSU antenna for increased range. In some instances, greater range is necessary than the 6 meter antenna height would allow because a fast moving emergency vehicle may otherwise reach an intersection before other vehicles in the intersection can clear it.

[6] While the NPRM indicates that it may be possible for an applicant to request a waiver of the antenna height correction factor, this possibility does not remedy 3M's concerns. It will be unduly expensive and time-consuming for state and local governments to prepare detailed waiver requests and related engineering justifications for each of the thousands of intersections that may be affected by the correction factor. Moreover, the NPRM and proposed draft rules do not contain any standard for grant of such waiver requests, thereby creating uncertainty for these government entities. Reliance on waivers

community, especially if 2, 3 or 4 intersection RSUs would be required where one RSU, optimally located, could provide the same capability.

The cost increases created by the proposed correction factor would be adverse to the public interest. Congress has mandated that the standards for DSRC must "promote interoperability among *and efficiency of,* intelligent transportation system technologies implemented throughout the United States."[7] In passing TEA 21, Congress concluded that intelligent transportation systems can mitigate surface transportation problems in a cost-effective manner, while reducing costs and negative impacts on communities and the environment.[8] Adopting the proposed antenna height correction factor would run counter to Congress' intent to promote efficiency and reduce costs, if public safety agencies must incur significantly greater equipment and engineering costs to comply with the correction factor. ITS America's interference concerns do not outweigh this detrimental affect. In particular, ITS America's concerns are unfounded, because (1) the propagation model applied by ITS America is inappropriate for most intersections controlled by a traffic light, and appears to have been inaccurately interpreted; (2) traffic light preemption signals are of very short duration, and are high priority safety communications; (3) the power reduction proposed by ITS America is arbitrary and unduly restrictive; and (4) the Commission and ITS America have proposed other measures that will eliminate interference. Each of these factors is discussed below.

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also has the undesirable effect of further burdening the Commission's scarce resources. As discussed herein, this outcome should not be necessary.

[7] Transportation Equity Act for the 21st Century, Pub. L. No. 105-178, 112 Stat. 107 (1998)("TEA 21").

[8] *Id.* At s5202.

A. The propagation model applied by ITS America is inappropriate for most intersections controlled by a traffic light, and appears to have been inaccurately interpreted.

ITS America argues that the antenna height correction factor is necessary because antennas placed higher than 6 meters above the roadway bed surface "might create a strong likelihood of interference with other licensees with adjacent or overlapping communications zones."[9] 3M is aware that ITS America bases its concern on its interpretation of the potential for signal increase caused by the theoretical reflection of signal off of the roadway bed as predicted by the "2 Ray" propagation model. However, as demonstrated in 3M's March 17, 2003 Comments and Exhibit 1 hereto, the 2 Ray prediction model is inappropriate for urban and suburban intersections.[10]

As noted in 3M's Comments, the 2-Ray model requires a perfectly flat reflecting surface, a clear line-of-sight path, a clear propagation path for the reflected ray, and the absence of other reflective sources. If any of these elements is not in place, the 2-Ray model should not be applied to the interference evaluation. 3M demonstrated that, in urban and suburban environments in which most traffic lights are deployed, the road surface is not flat, but is instead curved for drainage; there are parked cars, signs, and buildings that scatter and/or absorb radio signals; and there are vehicles on the road that block the intended recipient of the RSU's signal. Therefore, the 2-Ray model should not form the basis of an antenna height correction factor.

3M provided the Commission with propagation path analyses that confirmed this fact. To this end, the DSRC Standards Writing Group also had the benefit of an evaluation by an outside consultant concerning the applicability of the 2-Ray model for

[9] ITS America July 9, 2002 Ex Parte Comments at p.70.
[10] Most rural areas have few if any traffic lights.

DSRC standard-setting purposes. Exhibit 1 hereto includes photographs and propagation analyses from a study performed by TechnoCom for the Standards Writing Group. The report is titled "DSRC Physical Channel Characterization Final Report, June 30, 2000." This report was the basis for the antenna height correction factor. The following discussion is also based upon this study, but with different conclusions than those drawn by ITS America. In Exhibit 1, Figure 25 is a photograph of an urban test site. The photograph depicts a benign urban environment consisting of residential and storefront buildings, vehicles and foliage along the roadway. Figure 26 depicts the theoretical 2-Ray prediction, as well as the measured propagation data for this site.

The 2-Ray model predicts that doubling the height of the RSU antenna will cause a 6db increase in signal strength at the OBU. This is the theoretical basis for the antenna height correction factor. From Figure 26 it can be seen that, for the urban location shown in Figure 25, the measured data does *not* follow the predictions of the 2-Ray model. In fact, the measured data is significantly lower than what the 2-Ray model predicts, by a factor of 10-15 db.

Therefore, if the RSU antenna height were doubled from 3.5 to 7 meters, the actual signal level would still be less than the 2-Ray model would have predicted for an RSU height of 3.5 meters. From this it can be seen that the 2-Ray model is not remotely accurate in predicting signal strength in an urban environment, and clearly should not serve as the basis for an antenna height correction factor. It should be noted that the environment shown in Figure 25 does not approach the substantial signal blockage that will be encountered in a more crowded urban setting.

It should also be noted that the 2-Ray model prediction of a 6db increase, in received signal strength for a doubling of antenna height, was never verified for any urban location.

B. Traffic light preemption signals are of very short duration, and are high priority safety communications.

The record in this proceeding reflects universal agreement that public safety communications must be given top priority in the shared-use scheme proposed for DSRC.[11] By definition, traffic light preemption signals are of the highest priority, since such communications are *always* for the purpose of enabling a speeding emergency vehicle to race to the scene of a fire, accident, crime or other crisis. Therefore, the antenna height correction factor should not create an impairment to the cost effective deployment of such traffic light preemption technologies. Fortunately, any concern about signals coming from preemption system antennas above 6 meters is mitigated by the fact that these signals occur rarely, and are extremely short in duration. A typical signal preemption message, whether from an OBU or RSU, lasts only a fraction of a second. And for most intersections, there is likely to be a preemption event only once every several days, with the busiest intersections requiring preemption perhaps a few times in a given day. Because of the short duration of traffic signal preemption messages, and the relatively infrequent occurrence of such communications at a given intersection, signal preemption units should be able to operate at intersections in close proximity to each other without interference problems.

[11] NPRM at para. 18, 42; ITS America July 9, 2002 Ex Parte Comments at p. 52.

C. The power reduction proposed by ITS America is arbitrary and unduly restrictive.

As noted in 3M's Comments at p. 4, the antenna height correction factor proposed ITS America contains an arbitrary reduction of power. Thus, a DSRC system with an antenna mounted at 6 meters can operate up to a maximum power of 44.8 dbm EIRP, but must reduce its power to 33 dbm EIRP if the antenna is raised by a mere centimeter. In Exhibit 2 Figure 1, the proposed power reduction is shown graphically. This dramatic reduction in power does not reflect propagation reality, and does not provide DSRC licensees with the technical flexibility that the Commission calls for in the NPRM.

D. The Commission has proposed other measures that will eliminate interference.

ITS America indicates that the antenna height correction factor is necessary to prevent "interference" to other DSRC licensees. However, the Commission is considering other measures (based on the recommendations of ITS America and the DSRC Standards Writing Group) that will address any interference concerns, regardless of whether or not an antenna height correction factor is adopted. In particular, these measures include:

(1) DSRC proposals would be individually frequency-coordinated (or controlled by a Regional Public Safety Planning Committee), to ensure that the proposed system is based on sound engineering consideration that minimize the potential for interference;[12]

[12] NPRM at paras. 47, 50. In this regard, the frequency coordinator is able to ensure a system design that will use the minimal power necessary to accomplish the necessary communications, thereby mitigating antenna height concerns.

(2) Each DSRC RSU would be licensed by the Commission, so that prospective applicants are put on notice of the location, power and other technical characteristics of existing systems, and can engineer around these systems;[13]

(3) DSRC licensees are to share the spectrum, and prevent interference by monitoring prior to sending communications;[14]

(4) Public safety communications are to be assigned top priority;[15] and

(5) DSRC radio links must use the minimum level of power to facilitate the link with operation up to the maximum power as defined by type of operation.[16]

The adoption of these criteria would render ITS America's interference concerns largely moot.[17] Since the Commission contemplates overlapping areas of operation, and shared-use protocol, it should not be disruptive for traffic light preemption systems to operate with a power level and antenna height that allows for cost-effective deployment. Moreover, the communications taking place on such preemption systems will be of such duration and occurrence that any "interference" should be tolerable to other licensees, especially since these licensees will also be sending short data bursts. More importantly, the communications by emergency vehicles preempting a traffic light are the type of

[13] NPRM at para. 42.
[14] NPRM at para. 40; ITS America July 9, 2002 Ex Parte Comments at p. 63.
[15] NPRM at para. 42; ITS America July 9, 2002 Ex Parte Comments at p. 63.
[16] NPRM at para. 45; ITS America July 9, 2002 Ex Parte Comments at p. 65.
[17] Even if the Commission decides to forego site-by-site licensing in favor of geographic area licensing, the NPRM indicates (at para. 50) that public safety proposals would likely be subject to a Regional Public Safety Planning Committee process.

communications that must be accorded top priority. ITS America's concern is therefore more appropriately classified as a question of what the Commission's frequency re-use policy should be for DSRC, rather than an interference issue. It is respectfully submitted that the need for cost-effective deployment of public safety DSRC systems outweighs the ill-defined frequency re-use goal that apparently underlies the ITS America proposal.

Accordingly, 3M urges the Commission to refrain from adopting the proposed antenna height correction factor. In the alternative, the Commission should adopt a blanket exception for public safety priority systems such as traffic light preemption operations, or apply a correction factor only to antennas mounted above 8 meters.

II. THE COMMISSION SHOULD MODIFY THE DSRC EMISSION MASK

The Commission has requested comments on the emission mask adopted for DSRC in Rule Section 90.210, based on concerns raised by Mark IV Industries.[18] As 3M pointed out in its Comments (at p. 4), the emission mask adopted for DSRC Class D devices appears to be too restrictive, and may hinder the manufacture of affordable public safety equipment. The Commission and the intelligent transportation service community have both emphasized the need for flexible use and technical standards for DSRC, without undue restrictions.[19]

[18] NPRM at para. 70.

[19] *See* NPRM at para. 16; ITS America July 9, 2002 Ex Parte Comments at p. 32 (Recognizing that one of the policy objectives for a Commission mandated technical standard is "to minimize regulation and assure that any regulations [the FCC does] adopt remain in effect no longer than necessary" [*citing Advanced Television Systems and Their Impact Upon the Existing Broadcast Service,* MM Docket No. 87-268, Fifth Further Notice of Proposed Rulemaking, 11 FCC Rcd. 6235, 6236 (1996)]).

Emission mask "K" of Rule Section 90.210, which applies only to the 902-928 MHz and 5850-5925 MHz bands, appears to be more restrictive for out of band emissions than most other emission masks under Part 90. Emission mask K requires that once a licensee's signal extends outside of its band edge, the licensee must reduce power by 55+10log(P). Most other systems under Part 90 require less attenuation. For example, emission mask B, which applies to most other bands for equipment with audio low pass filters requires the following attenuation: 25 db on any frequency removed from the assigned frequency by 50% to 100% of the authorized bandwidth; 35 db on any frequency removed from the assigned frequency by 100% to 250% from the assigned frequency; and 43+10log(P) on any frequency more than 250% away from the authorized frequency. Neither the NPRM nor industry comments offer any substantial reason why the emission mask for DSRC must be more restrictive.

3M believes that the current Class D emission mask characteristics have not been proven to be commercially realizable and we believe that the Commission should forego implementing the Class D emission mask until valid technical limits can be defined.

III. CONCLUSION

Based on the foregoing, 3M urges the Commission to refrain from imposing an antenna height correction factor and Class D emission mask that may stifle the development and cost-effective deployment of important public safety technologies. Nothing in these comments should be construed as detracting from the remarkable work that ITS America has performed in driving the DSRC standards process. 3M respectfully submits that, at this nascent stage of DSRC development, it is too early to adopt overly-

restrictive emission masks and antenna height correction factors for public safety equipment, especially in the absence of substantial evidence that such restrictions are necessary.

Respectfully submitted,

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EXHIBIT 1

Excerpts from TechnoCom DSRC Physical Channel Characterization

Final Report, June 30, 2000

Figure 25. Measurement Locations Along Urban Street in Los Angeles (Eastbound Riverside Dr., east of Coldwater Canyon)

Figure 26. Path Loss on Urban City Street (of Figure 25)

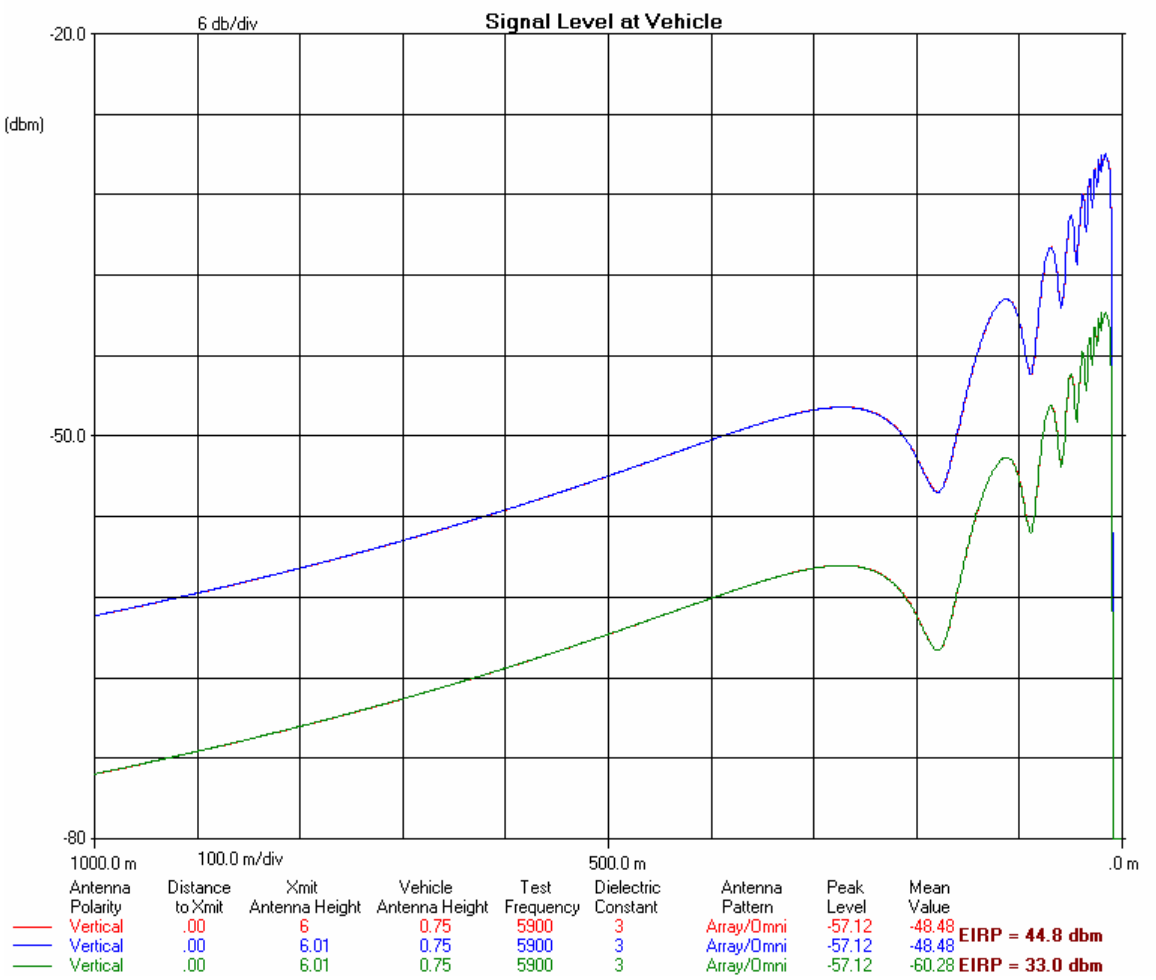
Signal Level at Vehicle
6 db/div
-20.0
(dbm)
-50.0
-80
1000.0 m
100.0 m/div
500.0 m
.0 m
Antenna Polarity
Distance to Xmit
Xmit Antenna Height
Vehicle Antenna Height
Test Frequency
Dielectric Constant
Antenna Pattern
Peak Level
Mean Value
Vertical .00 6 0.75 5900 3 Array/Omni -57.12 -48.48
Vertical .00 6.01 0.75 5900 3 Array/Omni -57.12 -48.48 EIRP = 44.8 dbm
Vertical .00 6.01 0.75 5900 3 Array/Omni -57.12 -60.28 EIRP = 33.0 dbm

EXHIBIT 2

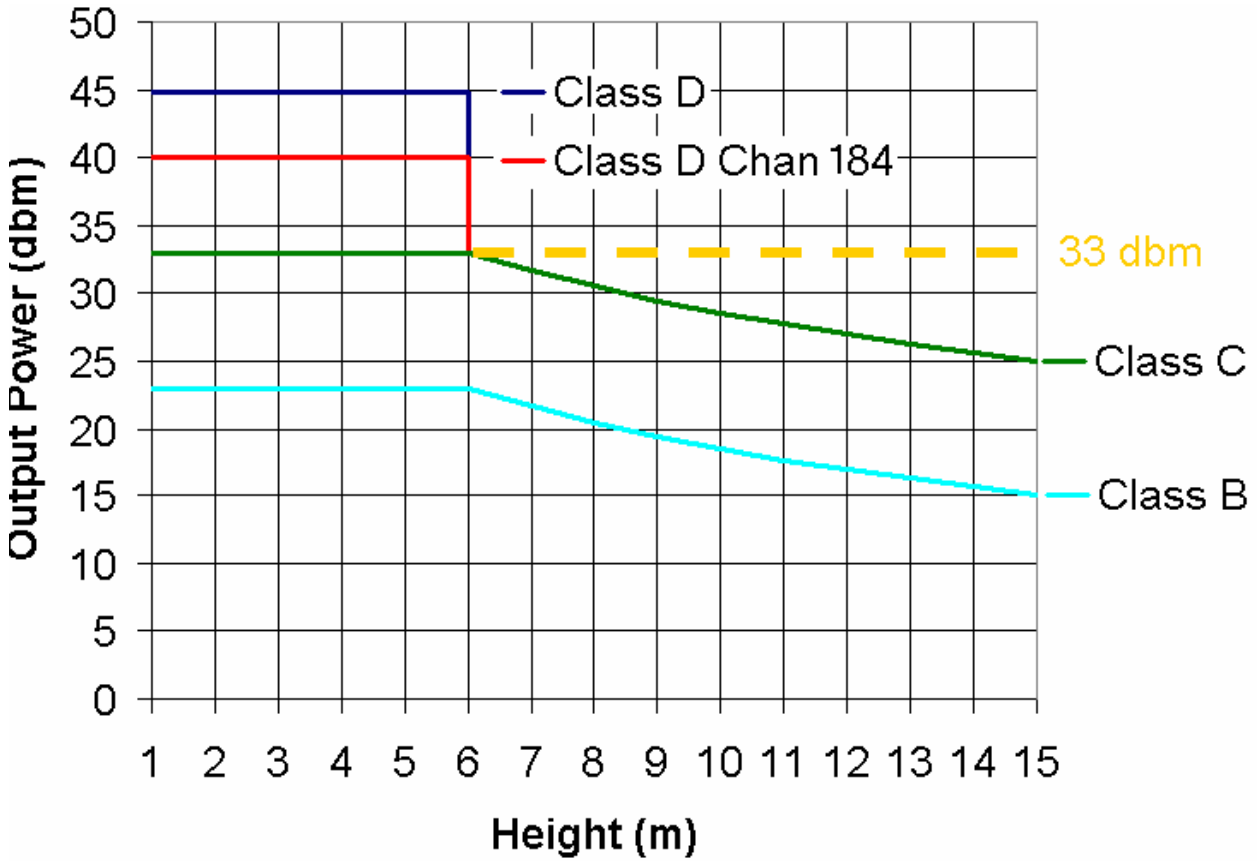

Figure 1. Example of Proposed Power Limitations Above 6 Meters

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